Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (currently amended) A diagnostic method, comprising:

estimating a temperature of a NOx-reducing catalyst based on a thermodynamic model of said NOx-reducing catalyst, wherein said model inputs comprise at least an amount of hydrocarbon stored in said catalyst;

estimating a hydrocarbon conversion efficiency of said NOx-reducing catalyst based on said temperature estimate; and

estimating a parameter indicative of an age of said NOx-reducing catalyst based on said estimated hydrocarbon conversion efficiency of said catalyst.

2. (original) The method as set forth in Claim 1 wherein said thermodynamic model of said NOx-reducing catalyst is described by the following equations:

$$\frac{d}{dt}\left(c_{substrate} m_{cat} T + c_{gas} m_{gas} T\right) - c_p W (T_{in} - T) + h_i A_{cat} (T_{amb} - T) + \left(W_{HC} \cdot f_{burn}(T) + f_{rel}(T) \cdot HC_{st}\right) \quad (1)$$

$$\frac{d}{dt} HC_{st} - (1 - f_{burn}(T)) \cdot W_{HC} \quad f_{rel}(T) \cdot HC_{st} \quad (2)$$

wherein $c_{substrate}$ is a heat capacity of a NOx-reducing catalyst substrate substrate, m_{cat} is a mass of said catalyst, c_{gas} is a heat capacity of the exhaust gas, m_{gas} is a mass of the exhaust gas in the catalyst, c_p is a heat capacity of air at constant pressure, W is a total exhaust flow into said catalyst, T_{in} is a temperature of an exhaust gas mixture entering said NOx-reducing catalyst, h_i is a convective heat transfer coefficient of said catalyst, A_{cat} is a catalyst area exposed to said exhaust gas mixture entering said

catalyst, T_{amb} is an ambient temperature, W_{HC} is a hydrocarbon flow transported in said exhaust gas mixture, $f_{conv}(T)$ is said hydrocarbon conversion efficiency of said catalyst, Q_{lhv} is a heat contained in a unit mass of fuel, $f_{rel}(T)$ is an amount of hydrocarbons released and subsequently oxidized, and HC_s is an amount of hydrocarbons stored in the catalyst.

3. (cancelled)

4. (original) The method as set forth in Claim 1 wherein said NOx-reducing catalyst is an ALNC.

5. (original) The method as set forth in Claim 1 wherein said NOx-reducing catalyst is an oxidation catalyst.

6. (original) The method as set forth in Claim 1 further comprising providing an indication of catalyst degradation based on said parameter.

7-16. (cancelled)

17. (currently amended) A diagnostic system, comprising:

an internal combustion engine;

a NOx-reducing catalyst coupled downstream of said engine; and

a computer storage medium having a computer program encoded therein, comprising:

code for estimating a temperature of said NOx-reducing catalyst based on a thermodynamic model of said NOx-reducing catalyst, wherein said model inputs comprise at least an amount of hydrocarbon stored in said catalyst;

code for estimating a hydrocarbon conversion efficiency of said NOx-reducing catalyst based on said temperature estimate; and

code for estimating a parameter indicative of an age of said NOx-reducing catalyst based on said estimated hydrocarbon conversion efficiency of said catalyst.